

Part 25 Icing Rulemaking, Policies and Issues



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include information provided
verbally at the conference



Rulemaking

- Existing Airplanes

- ◆ Severe icing AD's issued for Part 23 & 25 airplanes after the ATR72 accident in Roselawn, Indiana
 - Applicable to airplanes equipped with unpowered roll controls and pneumatic deicing boots.
 - Requires the flightcrew to exit icing after observing certain icing cues.
- ◆ Activation of ice protection AD's issued for Part 23 and 25 airplanes after the EMB-120 accident in Monroe, Michigan.
 - Applicable to airplanes with deicing boots.
 - Requires activation at the first sign of ice accretion.



Rulemaking

- Other rulemaking activities were tasked to the Aviation Rulemaking Advisory Committee (ARAC)
- ARAC Icing Rulemaking Activities
 - Part 25 and 121 Activation of Ice Protection Systems. (IPHWG)
 - Part 121 Exit Icing Conditions (IPHWG)
 - Part 25 Performance and Handling in Appendix C icing conditions (FTHWG)
 - Part 25 Supercooled Large Droplets (IPHWG)
- Details of the ARAC projects were presented at the conference by the co-chairs of the Ice Protection Harmonization Working group (IPHWG) and the Flight Test Harmonization Working Group (FTHWG)



Part 25 Policies and Issues

- Roll Control in Supercooled Large Droplets
- Inflight Ice Detectors
- Icing Protection of External Probes
- Certification by Similarity
- Revision to AC 25.1419-1



Roll Control in Supercooled Large Droplets

- Joint Part 23 and 25 policy memorandum issued to Aircraft Certification Offices on July 23, 1997.
- Applicable to airplanes equipped with pneumatic deicing boots and non-powered roll control systems.
- Evaluate new type certification programs for the susceptibility to roll upset should the airplane be exposed to certain freezing drizzle conditions.
- This is the same evaluation that was done after the Roselawn accident for similarly equipped existing airplanes.



Roll Control in Supercooled Large Droplets

Evaluation should consider a 20 minute exposure:

- ◆ Supercooled droplets having maximum diameters of approximately 400 μm
- ◆ Liquid water content of approximately 0.6 grams per cubic meter
- ◆ Median volumetric diameter of approximately 170 microns
- ◆ Temperatures near freezing



Roll Control in Supercooled Large Droplets

An alternative to developing ice shapes that could accrete in the specified conditions is offered in the policy memorandum.

An acceptable means of compliance consists of:

- ◆ One-inch high quarter-round molding, flat side forward
- ◆ Located aft of the active portion of the boots forward of the non-powered roll control surface (one wing only)
- ◆ High speed taxi test at various angles of attack
- ◆ Measure the forces required to maintain wings level.
- ◆ Extrapolate the forces to the maximum speeds expected while in holding conditions.
- ◆ The extrapolated forces may not exceed 50 pounds.



Inflight Ice Detectors

The FAA included some information on the certification of inflight ice detectors in Draft AC 20-73, Appendix K. The comment period for the AC closed in March 2003.

- Some aircraft surfaces may experience lower local temperatures than at the ice detector which will result in ice accretions in that location while no ice is forming on the ice detector.
- This phenomenon has been demonstrated in an icing wind tunnel.



Inflight Ice Detectors

- The phenomenon occurred in low freezing fraction conditions. (temperatures below, but near freezing)
- The applicant should perform analyses and tests to determine the icing conditions that may result in the ice detector not performing its intended function.
 - ◆ This is basic compliance with 25.1301.



Inflight Ice Detectors

- The applicant should show that a {primary} ice detector annunciates the presence of icing for all icing conditions which the airframe and engine induction system accrete unsafe quantities of ice.
 - ◆ i.e. In Appendix C icing conditions if ice accretions form prior to detection, the airplane must be able to safely operate with those ice accretions.
 - ◆ “primary” is shown in brackets because the AC doesn’t actually specify that it is only applicable to primary ice detectors. Although a case could be made that the guidance should not be applicable to an advisory ice detection system.



Ice Protection of External Probes

- Current TSO qualification standards for external probes do not adequately address FAR icing requirements.
- The FAA plans to develop new TSO's
- The specific ice protection rules for external probes are, for the most part, not specific when it comes to identifying the icing conditions that must be considered.



Ice Protection of External Probes

- For example:
 - §§ 23.1323 and 25.1323 require a means to prevent malfunction due to icing. The regulations do not specify the icing conditions that must be considered.
 - § 23.1325, requires that the correction between air pressure in the static pressure system and true ambient atmospheric static pressure is not altered when the airplane encounters icing conditions.
- § 25.1325 is similar to part 23 but does specify continuous and intermittent maximum icing conditions defined in appendix C of part 25.
- There are no specific icing regulations for stall warning or other external probes.



Ice Protection of External Probes

- For the regulations that do not specify the icing conditions it is necessary to rely upon §§ 23.1309 and 25.1309 to determine the icing conditions. The 1309 regulations require that equipment, systems, and installations perform their intended functions under any foreseeable operating conditions.
- With the current regulatory requirements, Appendix C icing conditions should be considered as foreseeable. This would change with the inclusion of a certification rule that includes supercooled large droplets.



Certification by Similarity

- For a similarity analysis the applicant must possess all the data to substantiate compliance with applicable regulations, including the data from past certifications on which the similarity analysis is based.
- The availability of data presents problems for Supplemental Type Certification programs that are not supported by the airplane manufacturer.



Certification by Similarity

- An STC application to replace original pneumatic deicing boots with new boots by a different manufacturer raised the question of whether the applicant should flight tests the new boots in measured natural atmospheric icing conditions.
- The Transport Airplane Directorate issued a memorandum to Aircraft Certification Offices (ACO's) in October 1998, to inform the ACO's of decisions related to:
 - ◆ Should flight tests in natural icing flight tests be required, and
 - ◆ Should the certification basis be upgraded?



Certification by Similarity

- Regarding flight tests in natural icing conditions:
 - ◆ The Transport Airplane Directorate took the position that the criticality of the deicing boot as part of the ice protection system dictates the prudence of requiring flight tests in natural icing, even for new design pneumatic deicing boots that are analytically similar to approved boots.
 - ◆ There may be cases where minor modifications to an existing certificated boot would not require flight testing in natural icing conditions providing the applicant has the data from past certifications on which the similarity analysis is based.



Certification by Similarity

- Regarding the updating of the certification basis:
 - ◆ The Transport Airplane Directorate took the position that since the deicing boot is a major component of the ice protection system the replacement of the certificated boot with a completely new design should be considered a significant change and would warrant updating the ice protection regulation to the most recent amendment.
- However, the FAA has recently issued 14 CFR Part 21 Changed Product Rule § 21.101 which changes how the certification basis is determined. Decisions on updating the certification basis will now be done in accordance with the Changed Product Rule.



Revision to AC 25.1419-1

- In May 2003, the FAA issued a proposal to modify AC 25.1419-1.
- The analyses section of the AC contains a Note 2 that states:

“An applicant may determine that protection is not required for one or more of these areas or components. If so, the applicant should include supporting data and rationale in the analyses for allowing those areas or components to go unprotected. The applicant should show that the lack of protection does not adversely affect the handling characteristics or performance of the airplane. If there is uncertainty about the effects of the lack of protection, the effects should be determined by flight test demonstration.”



Revision to AC 25.1419-1

- Several applicants have erroneously thought this note allowed adequate analysis and testing to preclude the requirement for flight testing in measured natural icing conditions.
- An AC may not supersede a rule, therefore Note 2 does not preclude the 25.1419(b) requirement for flight testing in measured natural icing conditions.



Revision to AC 25.1419-1

- The FAA proposes to clarify Note 2 by adding some words prior to the last sentence.
- The remainder of Note 2 is proposed to remain the same.
- Proposed revision to Note 2: An applicant may determine that protection is not required for one or more of these areas or components. If so, the applicant should include supporting data and rationale in the analyses for allowing those areas or components to go unprotected. The applicant should show that the lack of protection does not adversely affect the handling characteristics or performance of the airplane. {Insert clarifying words}If there is uncertainty about the effects of the lack of protection, the effects should be determined by flight test demonstration.



Revision to AC 25.1419-1

- Proposed clarifying words:
 - ◆ Section 25.1419(b) of part 25 at amendment level 25-72 requires certain flight testing. However, flight test data from previous certification programs may be used to show partial compliance with 25.1419(b) if it can be shown that the data is applicable to the airplane in question. This would generally require a similarity analysis. If a similarity analysis is used, the guidelines of paragraph 3(f) of this AC are applicable.
 - ◆ Comment period closes July 22, 2003